PATENT SPECIFICATION 1,049,607
DRAWINGS ATTACHED.

1,049,607

Date of Application and filing Complete Specification:
Nov. 30, 1964. *No. 48497/64.*

Application made in Japan (No. 63694) on Nov. 29, 1963.

Complete Specification Published: Nov. 30, 1966.

Index at Acceptance:—B8 BR8; A6 L(2B2, 2B4C).
Int. Cl.:—B 66 f /A 64 b.

COMPLETE SPECIFICATION.

Improvements in a Life-Saving Apparatus for Use in Buildings.

We, JISABURO SAITA, of No. 3, 3-chome, Yushimatenjin-cho, Bunkyo-ku, Tokyo, Japan, and HARUO SAITA, of No. 3, 3-chome, Yushimatenjin-cho, Bunkyo-ku, Tokyo, Japan, both subjects of Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a life-saving apparatus for use in buildings in emergencies.

Previous life-saving apparatus of this type consists of a long tubular structure, of any suitable material, in which both ends are open and are provided with a variety of fittings, such as ropes, hooks, hook openings etc. To use the apparatus, one end of the tubular structure is rigidly secured to the desired window or rooftop by fastening or hooking to the associated window sash, columns, eyebolts rings or the like. The tubular structure hangs down onto the ground and is maintained in an appropriate tilted and tensional position by a person or persons on the ground holding the fittings at this end. The life-saving apparatus is then ready for use.

However, the upper end of the structure is normally fastened to the building by hand, which is cumbersome and depends on the ability of the operator or operators. This is a disadvantage, as it becomes more difficult to perform the operation quickly in the confusion of an emergency.

Also the tubular life member itself is relatively light and has a large surface area and therefore tends to be greatly affected by a wind. For this reason, when throwing the tubular structure to the ground, it is difficult to reach an appropriate objective point unless persons on the ground work in co-operation.

Also it may be necessary for a fireman or firemen to climb the interior of the tubular structure in order to extinguish the fire and/or rescue persons within the building. However this climb is difficult and time consuming because no footholds that could help the climber are allowed along the internal wall, in case they hindered the smooth descent of the escaping persons. In addition, once a fireman has entered the tubular structure, the bottom portion narrows because of his weight.

The conventional structure has another serious disadvantage in that shouting is the only means of communication between the two ends.

The general object of the invention is, therefore, to eliminate the abovementioned disadvantages.

One object of the invention is to provide an improved life-saving apparatus in which the tubular structure is attached to a rotatable frame device which, when the lower end of the structure is thrown to the ground, rapidly and automatically prepares the tube as an escape route, thus eliminating the need for fastening the upper end of the tube to the building by hand.

Another object of the invention is to provide, associated with the rotatable frame device described above, a tubular structure, which not only permits escaping persons to descend smoothly but also allows the firemen to climb up the interior more easily by increasing the rigidity of the bottom portion of the tube, thus preventing it from narrowing during the climbing operation.

A further object of the invention is to provide a means of guiding the lower end of the tube, described above, so that it will reach any desired point on the ground.

Another object of the invention is to provide a means of communicating between the

two ends of the tubular structure described above without the necessity of shouting.

With the above cited objects in view, the invention consists of a life-saving apparatus in which a foldable frame unit is rotatably mounted on a supporting unit, the supporting unit being rigidly secured to the building and the frame being normally in its folded position, and in which one end of a tubular structure is attached to the folding frame unit so that when the other end is thrown the weight of the tube causes the frame to rotate, thereby allowing the tube to extend.

The outside of the bottom portion of the tubular structure is preferably fitted with rod-like elements or netting made of any suitable material which is more rigid than the tubular structure itself, thus forming footholds for the climbers, without affecting the ease with which the escaping persons may descend.

The lower end of the tubular structure may be attached to a weight which can be aimed at the desired point on the ground.

In order to communicate between the two ends of the tubular structure, transmitted and receiving devices connected by electrical leads, may be provided at each end of the structure or a voice tube may be provided.

The invention will become more clear from the following detailed description, studied in conjunction with the accompanying drawings in which:—

Figure 1 is a side elevational view of the entire life-saving apparatus in its folded position, as indicated in the invention;

Figure 2 is a perspective view of a rotatable frame device used in the apparatus of Figure 1 and illustrated in its folded position;

Figure 3 is a fragmental side elevational view of the apparatus in its operating position, with the lower portion of the tubular structure omitted;

Figure 4 is a perspective view of the rotatable frame device of Figure 2 in its operating position;

Figure 5 is a fragmental perspective view of the lower end of the tubular structure in its operating position;

Figure 6 is a fragmental view of one form of the outside of the bottom portion of the tubular structure;

Figure 7 is a view similar to Figure 6, but illustrating another form of the outside of the bottom portion of the tubular structure;

Figure 8 shows a person trying to climb along the interior of the conventional tubular structure as viewed from above with part of the tubular structure removed to illustrate him more clearly; ;

Figure 9 shows a view similar to Figure 8 but illustrating the present invention;

Figure 10 is a fragmentary view illustrating the relationship between the climber's foot and the interior of the bottom portion of the tubular structure; and

Figure 11 is a fragmental view illustrating a person descending through the lower portion of the tubular structure.

Referring now to Figure 1 of the drawings, the life-saving apparatus, generally referred to by the reference character S, includes a rotatable frame device, generally designated by the reference numeral 100, and a tubular structure, generally designated by the reference numeral 201, which is disposed in the rear of the rotatable frame device 100 in its folded or stowed position. The rotatable frame device includes a stationary frame unit 101 whose base is rigidly secured to a building (not shown) at any desired window, outer wall or to the interior of a palisade W disposed on its rooftop, by bolts 102 and the associated nuts 103. The tubular structure 201 has one open end sewed or otherwise attached to a part of the rotatable frame device 100.

As shown in Figures 1 and 3, the frame unit 101 which supports the rotatable frame device 100 may be composed of angle bars of any suitable material, such as steel, welded to each other to form a right hexahedron. Alternatively, it may be an iron or steel casting. The stationary frame unit should be constructed with a hollow space, 104, large enough to accommodate the rotatable frame unit which is generally designated by the reference numeral 105, to be described later, and have a top face defined by three frame members having the edge nearest the tubular structure in its stowed position, open to enable the rotatable frame unit to move from its stowed position to its operating position and *vice versa*. The pair of lateral frame members, 106, which form the opposite edges of the top face of the base frame unit 101 have a pair of bearings, 107, for rotatably supporting the rotatable frame unit 105 and a pair of hinges 108 for rotatably supporting a U-shaped bridging member 109, which may, for example, be formed by a steel pipe and has a roller 110 rotatably disposed on its base portion.

The base frame unit also has a connecting frame member 111 joining the ends of the pair of lateral frame members 106 and limiting the counter clockwise rotational movement as viewed in the figs of the rotatable frame unit. When the bridging member 109 is moved from its vertical position, as illustrated in Figure 1, to its horizontal position, as illustrated in Figures 3 and 4, in the counterclockwise direction, the horizontal position is maintained by a stepped projection or a stopper 112 which is disposed at the junction of the lateral frame members 106 and the connecting member 111. As shown in Figure 2, the U-shaped

member 109 includes a plurality of parallel rods 113 connecting its leg portions for the reasons that will be apparent later.

The rotatable frame unit 105 includes a shaft member 114, mounted rotatably at each end by the bearings 107, a pair of L-shaped and a pair of straight supporting frame members, 116 and 115 respectively, extending from each end of the shaft member 114, one member from each pair being joined together at their free ends and these ends being connected by a rod. As best shown in Figure 4, the L-shaped supporting members 116 are connected by a rod 117 on which an intermediate U-shaped frame member 118, is pivotably mounted. Then a mounting frame member 119, to which the tubular structure is attached, is pivotably mounted on the base portion of the U-shaped frame member 118. The frame members 118 and 119 may be made, for example, from a steel pipe.

When the rotatable frame unit 105 is in its stowed position it fits into the hollow space in the stationary frame unit in such a manner that the mounting frame member 119 is folded over the intermediate frame member 118, disposed substantially vertical, and is positioned between the plane of the longer arm portions of the L-shaped supporting frame member 116 and the plane of the frame member 118 as shown in Figures 1 and 2. The rotatable frame unit 105 can be moved from its stowed position to its operating or extended position in which the intermediate and mounting frame members, 118 and 119, are positioned substantially horizontally in aligned relationship as shown in Figures 3 and 4. In order to maintain the mounting frame member 119 substantially horizontal, flexible elongated elements 120, such as wire cables, are fixed to span the distance between the base portion of the mounting frame member 119 and the rod connecting the supporting frame members 115—116.

Further in order to cover the two triangular areas defined by the expanded cables 120 and the lateral portions of the frame members 118 and 119 in their horizontal position, and an area defined by the pair of cables 120, a cover member is provided which automatically expands or folds with the extension or folding of the rotatable frame unit. This cover member is designated by the reference numeral 121 in Figure 3 but not shown in Figures 1 and 2. Both the cover member 121 and the main body of the tubular structure are preferably made of a suitable fire-proof or refractory fabric.

As shown in Figures 1, 3 and 5, one end of the tubular structure is attached to the mounting frame and remains open. At the other end, the tubular structure has at least one pair of looped ropes 202, which are detachably connected to a throwing weight 203 by means of another rope 204. Each of the looped ropes 202 are operatively coupled to a pulley 205 and a looped clutch or hook 206 mounted on the shaft of the pulley for reasons that will be described later.

In an emergency, such as an earthquake or a fire, the throwing weight 203 can be thrown out of the building in a suitable direction. When the weight is thrown the tubular structure extends from the building and its weight causes the rotational frame unit to rotate and extend from its stowed to its operating position. At the beginning of this movement the rotating frame unit 105 pushes the parallel rods of the U-shaped bridging member 109. Therefore, the bridging member is similarly moved from its stowed to its horizontal position. In its extended position, as illustrated in Figures 3 and 4, the intermediate frame member 118 is supported by the roller 110 on the base portion of the U-shaped bridging member 109.

The need for the bridging member 109, the straight supporting frame member 114 and the intermediate frame member 115 is as follows. Obviously the mounting frame member 119 could be directly mounted for rotational movement in the pair of the bearings 107 on the base frame unit. However in this case, the area of the opening in the mounting frame member 119 in its operating position is reduced by at least an extent corresponding to the thickness of the outer wall W, as will be readily understood from Figures 1 and 3. This increases the difficulties of escaping persons. On the other hand, if the mounting frame member 119 is lengthened to provide a sufficient opening, it will be difficult for it to pass through a relatively low window. If the life-saving apparatus is disposed by a high window or if the apparatus has no obstacle above it, as for example on a rooftop, a long mounting member may be used. However, it is then necessary to increase the level of the lower side of the window relative to the associated chamber floor because in its stowed position the mounting frame is vertically disposed and must be accommodated between the lower side of the window and the chamber floor. Even if a long mounting frame could be used, the escaping persons would have difficulty in climbing the mounting member.

From the foregoing it will be appreciated that in order to make the mounting frame member capable of extending sufficiently from the building and at the same time to enable it to be stowed at a relatively low level, it is preferable to use the foldable intermediate frame member 118. Also to

keep the intermediate frame member horizontal during use, the U-shaped bridging member 109 supports it, without interfering with the opening and closing of the window.

It is further preferable to keep the mounting frame member 119 horizontal by use of the flexible ropes attached to the supporting frame member 115. However, if desired, the mounting frame member 119 may be mounted directly the base frame unit 101.

When the lower end of the tubular structure has reached the required point on the ground someone can immediately disengage the throwing weight and separate the pair of flexible ropes 202 from each other. The separated flexible ropes 202 are then moored at respective anchorings A (see Figure 5) each buried in the ground and normally closed by a cover C by having the hooks 206 engaging the anchorings A. The life-saving apparatus is then ready for use.

According to the objects of the invention the lower open end portion of the tubular structure is reinforced to ensure that it remains open. To do this, many relatively rigid bar-like elements may be sewed into the open end portion of the tubular structure on at least both lateral sides 207 (see Figure 5). Alternatively, the end portion of the tube may be folded back or rolled up for reinforcement.

As previously noted, a disadvantage of the conventional type of tubular structure is that when a fireman seeks to climb it, his weight depresses the lower side or bottom portion thereof to form a V-shaped cross-section (see Figure 8), which results in a decrease in the cross-sectional area. This decrease in the cross-sectional area makes it easier to slide down the interior and hence makes the climb very difficult. The invention eliminates this disadvantage as described below in conjunction with Figures 5 to 7.

In Figures 5 and 6 the tubular structure has a relatively rigid netting, 209, sewn to its external, bottom portion, 208, so that the closer meshes of the netting are arranged longitudinally to the tube. Instead of the netting, bars, 210, which may be made for example, of any suitable plastic may be disposed at set intervals on the external surface of this bottom portion, substantially perpendicular to the longitudinal axis of the tubular structure (see Figure 7). The measures as just described and illustrated in Figures 5 to 7 ensure that the cross-section of the tubular structure in its extended state is always substantially quadrilateral because of the rigidity of the netting 209 or bars 210 which also serve as footholds (see Figure 9) and prevent the climbing person from sliding. In this way, the climbing operation can be very easy. Therefore the fire-extinguishing and rescuing operations can be performed extremely easily and rapidly through the extended tubular structure.

The footholds such as the netting 209 or spaced parallel bars 210, have an unexpected effect in that they do not impede the descent of the escaping persons. The reason for this is that as any person descending the interior of the extended tubular structure has his legs stretched out (see Figure 11) and his weight distributed over a relatively large area, the material in the space between adjacent footholds is not greatly displaced.

In order to communicate between the two ends of the extended tubular structure a pair of flexible pipe members, 211, are fixed in a suitable position for example in the two upper corners, as shown in Figure 5. A set of flexible electric conductors 212 and/or a voice tube 213 are threaded through the pipes. A microphone and receiver device is connected to each end of the electric conductors.

To stow the tubular structure after the emergency, the hooks 206 can be disengaged from the associated anchorings A and reconnected to the throwing weight 203. Thereafter the supporting frame members 115 and 116 are rotated from their extended position as illustrated in Figures 3 and 4 to their stowed position as illustrated in Figures 1 and 2 while the tubular structure is pulled up. The roller 110 on the bridging frame member 109 helps the tubular structure to be pulled up smoothly. After the tubular life member 201 as well as the ropes 202 and the throwing weight 203 has been pulled up. The bridging frame member 109 is then returned back to its original or pendent position and the tubular structure is folded as shown in Figure 2. Thus the life-saving apparatus is ready for another emergency.

While the invention has been described in conjunction with certain preferred embodiments, it is not limited thereto and various changes in the details of the construction and the arrangement and combination of the parts may be used without departing from the spirit and scope of the invention.

WHAT WE CLAIM IS:—

1. A life-saving apparatus comprising a supporting frame unit rigidly secured to a building, a foldable frame unit rotatably mounted to the said supporting framework and including a plurality of foldable frame members, the foldable frame unit being normally stowed in its folded state in an interior space in the said supporting frame unit, and having its operating position such that the foldable frame members project externally of the supporting frame unit and are in a substantially horizontal line, one

end of a tubular structure being attached to the frame member which, in the operating position, is furthest from the foldable frame unit, the end of the tubular structure remaining open, the tubular structure being normally in its folded state adjacent to the supporting frame unit, the arrangement being such that in an emergency, the tubular structure is thrown from the building and, because of its weight, causes the foldable frame unit to rotate to its operating position.

2. A life-saving apparatus as claimed in claim 1, wherein the tubular structure has a netting attached to the external surface of its bottom portion, when extended, the netting serving as footholds for persons climbing the interior of the tubular structure.

3. A life-saving apparatus as claimed in claim 1, wherein the tubular structure has a plurality of bar-like elements, disposed at predetermined intervals on the external surface of its bottom portion, substantially perpendicular to the longitudinal axis of the structure, and serving as footholds for persons climbing the interior of the tubular structure.

4. A life-saving apparatus as claimed in claim 1, wherein the tubular structure includes a throwing weight removably connected to one end.

5. A life-saving apparatus as claimed in claim 1, wherein the tubular structure includes an information transmitting and receiving device fitted at each end and connected by electrical conductors so that communication can take place between the two ends.

6. A life-saving apparatus as claimed in claim 1, wherein the tubular structure includes a voice tube extending through the structure for communication between the two ends.

7. A life-saving apparatus as claimed in claim 1, wherein the foldable frame unit includes a support frame member capable of projecting upwardly when the foldable frame is in operating position, an intermediate frame member pivotably mounted to the said support frame member and substantially horizontal in the operating position, a mounting frame member pivotably mounted to the said intermediate frame member and in a substantially horizontal line with the intermediate frame member in its operating position, and at least a pair of flexible elongated elements connected to the said supporting and mounting frame members and holding the mounting frame member in its substantially horizontal position.

MARKS & CLERK,
Chartered Patent Agents,
Agents for the Applicants.

Abingdon: Printed for Her Majesty's Stationery Office, by Burgess & Son (Abingdon), Ltd.—1966.
Published at The Patent Office, 25 Southampton Buildings, London, W.C.2,
from which copies may be obtained.

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Fig. 1

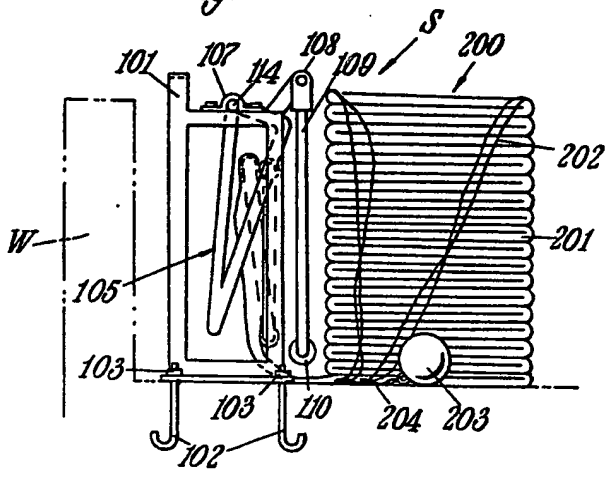
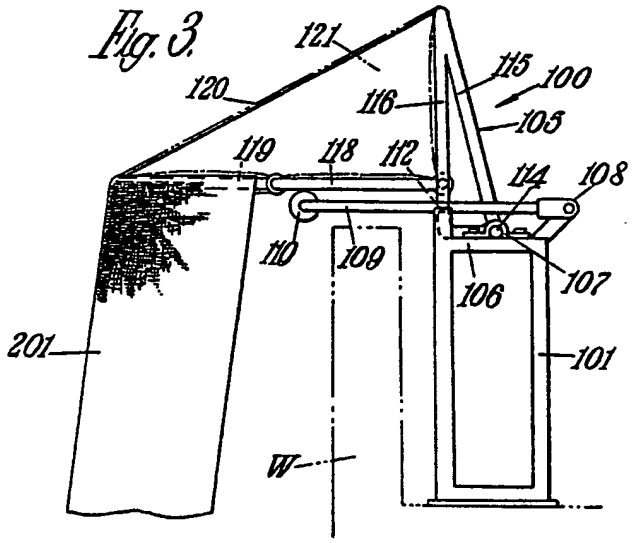


Fig. 3.



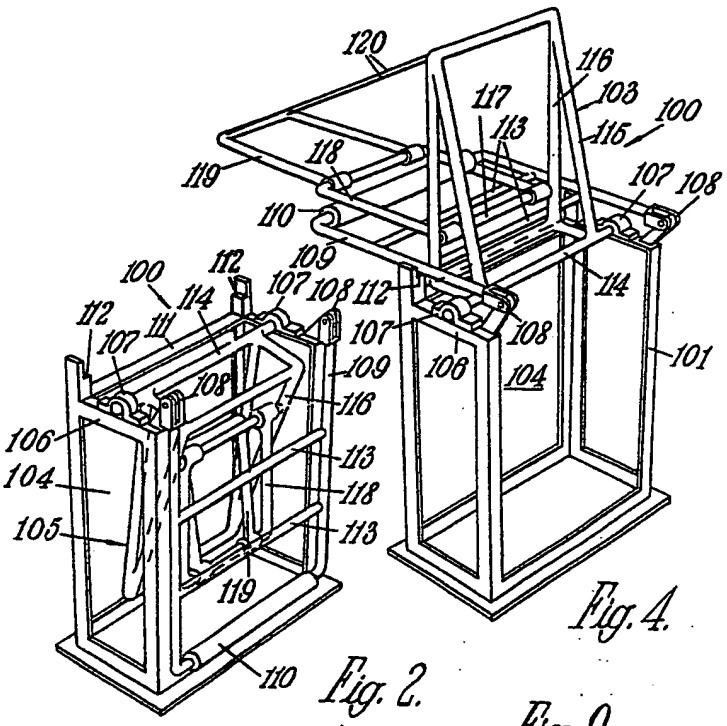
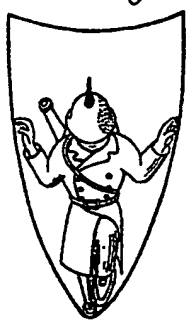


Fig. 4.

Fig. 2.

Fig. 9

Fig. 8.



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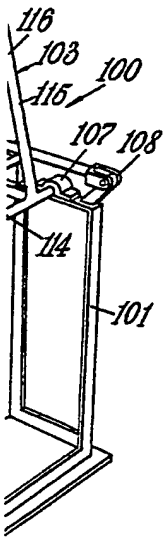


Fig. 4.

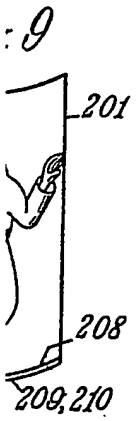


Fig. 5.

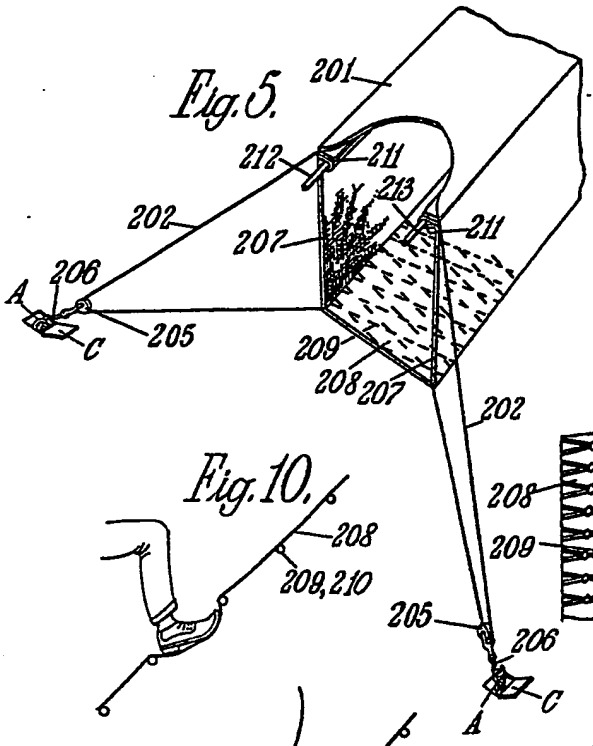


Fig. 6.

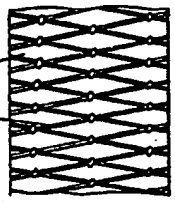


Fig. 10.

Fig. 11.

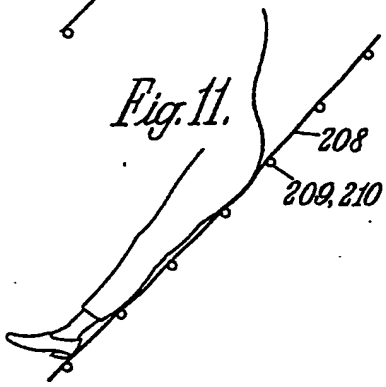
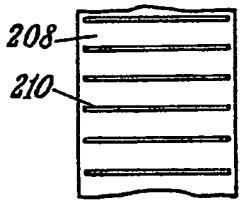


Fig. 7.



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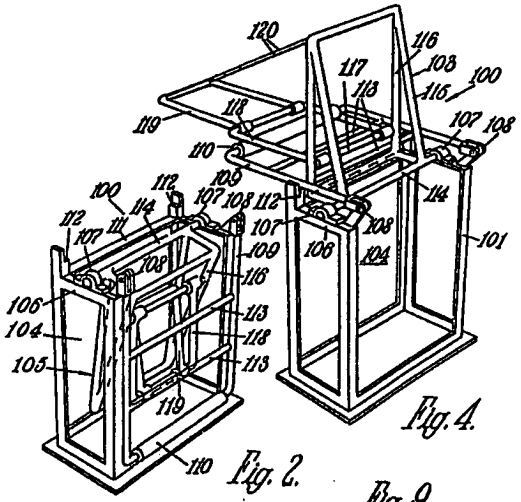

Fig. 4.

Fig. 2.

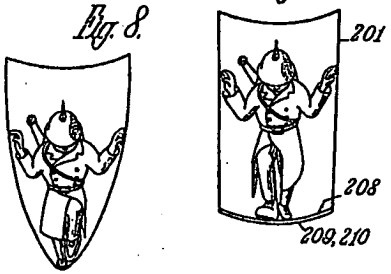

Fig. 9

Fig. 8.

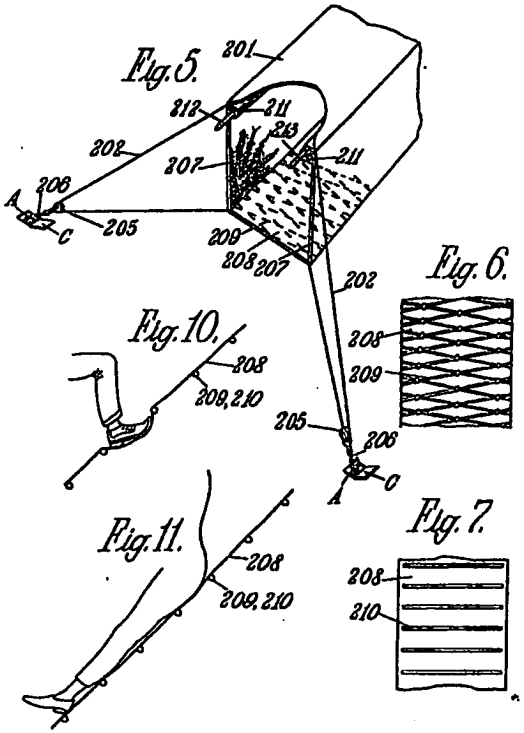

Fig. 5.

Fig. 6.

Fig. 10.

Fig. 11.

Fig. 7.